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What Causes Non-performing Loans to Soar? Empirical Evidence from An Emerging Economy

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Abstract

This paper empirically investigates firm specific factors as well as board structure that cause non-performing loans to rise in Bangladesh. It is conducted on an unbalanced panel dataset of 22 listed commercial banks for the period of 2010-2022. Using robust bank clustered standard errors, Pooled OLS, Fixed Effect as well as Random Effect Model are applied and results indicate that profitability, capital adequacy and asset growth of banks reduces NPLs while higher inefficiency increases NPLs. While corporate governance features like board size and female representation of board have no effect, higher independent directors reduce NPL. Subsample analysis indicates that the effect varies between different (High vs Low) risk and growth categories. Furthermore, interaction term show that during pandemic, larger board size and increased female directors reduce NPL. System GMM controls for reverse causality and confirms baseline findings. While majority literature focuses on country specific factors such as economic growth, employment, inflation etc., this paper investigates bank specific determinants of NPLs in context of an emerging economy using hand collected datasets.

Keywords: Non-performing Loans, Listed Banks, Emerging Economy, Bangladesh
JEL Classification: G21; G30

1. Introduction

Banks play an integral role in channeling small and discrete savings to profitable investment segments (Prochniak & Wasiak, 2017). A stable banking industry is critical to a country's economic growth and financial system resilience. To ensure the flow of fund efficiently, banks screen and monitor borrowers and enforces credit agreements (Choudhary & Jain, 2021). Despite these measures, several macro-economic as well as bank-specific factors can contribute to a high level of loans that are in nonpayment or about to default - also stated as

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Non-Performing Loans (NPLs) (Cerulli *et al.*, 2020). The International Monetary Fund describes NPL as the amount of principal and interest that is overdue by no more than three months or 90 days (IMF, 2005). NPLs pose several challenges for banks including reduced profitability, capital erosion, increased operational costs, lower liquidity, higher credit risks, all of which contribute to the financial instability of the bank (Konstantakis *et al.*, 2016). Additionally, NPLs represent the bad credit quality of bank loan portfolios, cumulatively, they represent bad credit quality of the country's banking industry (Ozili, 2019). Moreover, high NPL ratio can be considered as an early indicator of banking crises because they restrict growth in the economy by reducing credit development (Reinhart & Rogoff, 2010; Ivanović, 2016). Therefore, NPLs have become a hazardous threat to the banking industries, particularly among emerging economies where often banking sector is controlled by tycoons or politically influential families (Morck *et al.*, 2011). Consequently, it is crucial for banks to identify the factors contributing to rising non-performing loan levels in order to promptly control them.

An extensive body of empirical studies have examined the variables that influence Non-Performing Loans (NPLs) using macroeconomic or bank-specific explanatory (Louzis *et al.*, 2012). One stream of studies investigates macroeconomic determinants comprising GDP, inflation rate, interest rate, unemployment (Louzis *et al.*, 2012; Dimitrios *et al.*, 2016; Ghosh, 2017; Ari *et al.*, 2021). Another stream of research highlighted the impact of bank-specific factors on the non-performing loan levels in particular ROA, ROE, capital, size, efficiency, asset quality, profitability, credit growth, and corporate governance factors while a few studies uses both macroeconomic as well as bank-specific variables to examine bank NPLs (Louzis *et al.*, 2012; Ekanayake & Azeez, 2015; Dimitrios *et al.*, 2016; Tarchouna *et al.*, 2017; Khan *et al.*, 2020; Choudhary & Jain, 2021). Moreover, volatile periods including the European sovereign debt crisis, the global financial crisis, and the recent COVID-19 pandemic exacerbate the stresses on bank asset quality and increase the risk of high NPLs (Konstantakis *et al.*, 2016; Ari *et al.*, 2021). However, the results varies depending on the country of the sampled banks and the duration of the sample (Ari *et al.*, 2021). Given the pronounced connection between NPL and the

economic development, it is perhaps even more vital now to comprehend the determinants of NPL in region specific research.

Bangladesh, an emerging country in Asia is an ideal setting for this research. Despite many hurdles like Global Financial Crisis, COVID-19, political turmoil, Bangladesh economy has been experiencing rapid expansion with averaged 6.4% GDP growth between 2012-2022 (Mahbub & Chung, 2024; World Bank Group, 2024). Bangladesh currently has 62 schedule banks which are serving the large population by pooling savings and channeling savings toward profitable investments; among these 6 are state owned commercial banks, 43 are private commercial banks (out of which 33 are conventional interest based and 10 are founded on Islami Shariah), 3 are specialized banks, 1 is digital commercial bank and 9 are foreign commercial banks (Rashid *et al.*, 2020; Bangladesh Bank, 2024). With this astounding economic growth, however, Bangladesh also experienced growth of highest NPLs rate in the region, its NPL rates were 7.7% and 8.0% in 2020 and 2021, respectively (World Bank Group, 2024). Compare to other Asian countries, the banking industry in Bangladesh experiences a high NPL rates where default loans reached an all-time high of Tk 182.30 billion in the year 2024 (Rehman *et al.*, 2024; Asian Development Bank, 2025). According to the central bank in Bangladesh, NPLs are grouped according to their quality and repayment status. For example, a loan is classified as "Substandard" if it is past due by three to nine months, "Doubtful" if it is past due by nine to twelve months, and "Bad or loss" if it is past due by more than 12 months (Bangladesh Bank, 2019). Furthermore, the recent high NPL rates in this country exist owing to lenders face multiple barriers, including fraud, higher import costs, poor payment discipline of borrowers, poor corporate governance and weak regulatory enforcement (Akhter, 2023).

The banking sector performs a highly significant part in Bangladesh, as it provides both short- and long-term capital in lack of a dynamic and efficient capital market (Mahbub & Chung, 2024; Rehman *et al.*, 2024). High rate of NPLs is a critical issue for an emerging economy like Bangladesh as it poses significant challenges not only to the banking sector but also to the economic stability, and overall financial growth (Adhikary, 2006; Rehman *et al.*, 2024). It further

heightens the importance to study NPL as Bangladesh is a bank centered financial system (Akhter, 2023). Bangladeshi banks must thus determine the root cause of the rising percentage of non-performing loans and implement corrective steps to resolve them. In this paper, we present empirical evidence from bank-specific factors that cause non-performing loans (NPLs) to rise in Bangladesh.

Our study aims to provide several contributions to the NPLs literature. Extant literature mostly analyzes the relation between macro-economic variables and with NPL. However, macro-economic variables are standardized across regions and time period (Louzis *et al.*, 2012). Whereas we analyze a panel dataset of 22 listed commercial banks between the period of 2010-2022, contributing to the existing literature by examining the correlation of bank-specific factors that determine shifts in NPLs. In absence of a national accessible database, we source data directly from annual reports and Dhaka Stock Exchange website which minimizes data errors. Our analysis could serve as a framework for evaluating bank vulnerabilities to reduce NPL in future. Finally, the study focuses on the banking system in Bangladesh, where despite an upward trajectory in economy, banks deal with a large volume of default loans and have lower asset quality than other nations in the region (Mahbub & Chung, 2024). Compared to previous studies on Bangladesh (Rashid *et al.*, 2020; Akhter, 2023), our sample is larger with a wider time frame which increases the reliability of this study. As a result, our findings will assist banks and policymakers in responding to the considerable risk factors associated with NPLs aggregation which can increase the sustainability of the banking sector in Bangladesh and other emerging economies such as India, Pakistan, Sri Lanka, Vietnam etc.

The rest of the sections of this research paper are arranged as follows: review of relevant literature for the study included in Section-2. A description of research methodology can be found in Section-3. Furthermore, Section-4 presents results as well as discussions. Section-5 provides a final summary of the paper's key findings, implications, limitations and direction for future research.

2. Literature Review

2.1 Theoretical Background

In order to understand the drivers of NPL, we must look at the theoretical foundation which indicates that bank specific determinants may play a crucial role in the loan quality of banks. For example, "Moral hazard hypothesis" states that when one transacting party engages in dubious acts and thus incurs risk thinking that it is under protection, and another entity will bear the cost, moral hazard occurs (Gupta & Jain, 2022; Fu & Trigilia, 2024). Managers may involve in risky lending behavior given that banks are often considered "too big to fail" and government ultimately rescue troubled banks with taxpayers' money (Gupta & Jain, 2022). This theory can be attributed to banks' ill intention managers who intensifies the riskiness of banks' loan portfolio when the bank has lower capital base (Berger & DeYoung, 1997) and can be used to interpret why banks with small capitalization are likely to have an increase in NPLs. Another seminal theory which can be applied to understand the drivers of NPLs is "Agency theory" where managers (agent) and shareholders (principal) holds conflicting interest and bank managers may put their own incentives over maximizing shareholder's wealth (Eisenhardt, 1989; Darayseh & Chazi, 2018). Under agency theory perspective, managerial excessive Risk taking can be mitigated by an effective board which is responsible for monitoring managerial actions (Fama & Jensen, 1983; Abou-El-Sood, 2021).

In addition, "Bad management hypothesis" can be applied to this scenario to explain that banks with poor management skills will fail to effectively control non-interest income (Podpiera & Weill, 2008). Bank manager with poor skills will end up creating lower quality of loans and gain low-cost efficiency or high inefficiency (Berger & DeYoung, 1997). Therefore, banks suffering from bad management will face deteriorations in cost efficiency which in turn will increase non-performing loans and the likelihood of bank failures (Podpiera & Weill, 2008). Finally, "Diversification hypothesis" demonstrates that income diversification and efficiency enables banks to exploit the probable benefits of income diversification and risk reduction which ultimately may reduce NPLs (Alhassan, 2015). Moreover, diversification of banking functions optimizes

managerial efforts across various dimensions (Gambacorta *et al.*, 2014). Although all the aforementioned theories have merit, empirical evidence can corroborate which one explains this phenomenon best.

2.2 Prior Studies and Hypothesis Development

Amid a variety of measures to inspect the factors affecting NPLs in literature, no standardized approach can be extrapolated. Data availability constitutes a significant barrier, greatly restricting the methodological alternatives in this context (Louzis et al., 2012; Khairi et al., 2021). Nonetheless, Louzis et al. (2012) show that drivers of NPLs can come from bank specific factors as macroeconomic factors can be exogenous to banks. Nevertheless, empirical evidence suggests that adequate profitability is essential for the sustainability of commercial banks and thus, profitability has been considered heavily in banking literature (Boudriga et al., 2010; Darayseh & Chazi, 2018; Khan et al., 2020). Bank starts to invest in high risky project to combat low profitability which in turns increases NPL (Boudriga et al., 2010).This has been echoed by the negative connotation found between Return on Assets (ROA) and bank non-performing loans in developing economies (Khan et al., 2020). Thus, our first hypothesis is constructed as follows:

H1: Return on assets has a negative effect on listed banks' NPL.

Following the "Bad management hypothesis" and "Agency theory", it can be argued that bad managers in banks are likely to be inefficient and poor management is likely to be reflected in the higher cost function or lower operating efficiency. On a similar note, Berger and DeYoung (1997) drew attention to the relationship between cost efficiency and problem loans. Empirical studies find that operating efficiency of commercial banks is be an important determinant of NPLs and inefficient banks are found to have higher NPLs in developing economies like Czech Republic, Pakistan and Sri Lanka (Podpiera & Weill, 2008; Ekanayake & Azeez, 2015; Khan *et al.*, 2020). Hence, the second hypothesis of our paper is constructed as follows:

H2: Inefficiency has a positive effect on listed banks' NPL.

In addition, young and old firms tend to differ in how they operate and deserve separate consideration (Coad et al., 2018). The age of the commercial bank can be linked to the experience of the bank in handling crisis. Moreover, Partovi and Matousek (2019) find a statistically significant positive association between banks' age and technical efficiency in Turkey. When banks are operating for a long time, they tend to mature and gain experience in banking operations, which ultimately rises the possibility s of minimizing NPL by functioning effectively (Ayayi & Sene, 2010). Therefore, our third hypothesis is formulated as follows:

H3: Banks' age has a negative effect on listed banks' NPL.

Furthermore, Capital Adequacy Ratio (CAR) is another common determinant variable used in the extant literature. CAR is set by global bank supervisory board, The Basel Accord in order to manage bank's risk and to defend them from insolvency (ElBannan, 2017). Capital reduces financial distress and enables a bank to absorb abnormal losses which is crucial for the survival of a bank (Diamond & Rajan, 2000). Interestingly, Gambacorta and Mistrulli (2004) show that bank capital is linked to its lending behavior. Consistent with moral hazard hypothesis, managers of low capitalized banks are inclined to provide high risk loans that lack proper credit rating and monitoring in order to boost income. Our fourth hypothesis is formulated as follows:

H4: Bank capital has a negative effect on listed banks' NPL.

Finally, boards plays a crucial part in the corporate governance of a commercial bank (García-Meca et al., 2015). Empirical studies report that board diversity such as board size, female percentage and board dependences influences bank level outcomes like performance, risk and lending behavior (García-Meca et al., 2015; Arnaboldi et al., 2020; Issa et al., 2021). In addition, banking industry is found to be more sensitive to poor corporate governance practices than any other sectors (Rehman et al., 2016). Although there is no consensus in the extant literature about the optimal board size that can enhance board's monitoring ability, board size is found to increase firm performances in Bangladesh (Rashid, 2018). However, Rehman et al. (2016) find that board size is positively linked

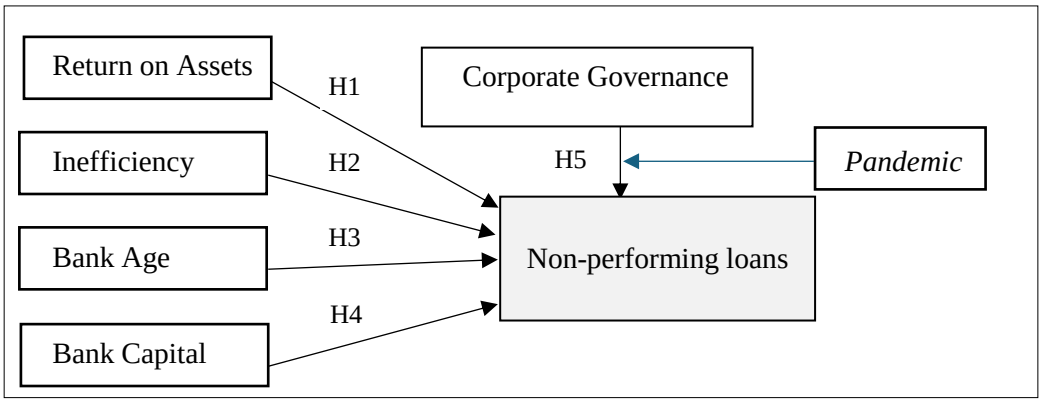
with Non-performing loans in banks during 1998-2009. In addition, women directors are good at monitoring and managing risk (Sattar et al., 2022) and thus, are found to increase bank level outcome such as performance (García-Meca et al., 2015). Furthermore, using a cross-country sample of large banks, Vallascas et al. (2017) show that in the aftermath of the 2007–2009 crisis, an increase in percentage of independent directors on board is linked to more prudent bank risk-taking as independent directors exercise a stringent risk oversight and monitoring of bank executives. Following the extant literature, our last hypotheses are formulated which are shown below along with our conceptual framework:

H5a: Board size has a positive effect on listed banks' NPL.

H5b: Female representation on board has a negative effect on listed banks' NPL.

H5c: Board independence has a negative effect on listed banks' NPL.

Figure 1: Conceptual Framework of the Study



Source: Authors' own work

3. Methodology

3.1 Sources of Data

Our panel dataset includes 261 bank-year observations from 22 listed commercial banks during the period of 2010-2022. Islamic banks are excluded from our sample as these banks functions as per Islamic Shariah (binding code of life stated in Islam) rather than conventional interest-based mechanism (Abdul-Majid et al.,

2010). Data used in this research is collected from respective banks' annual reports as well as from the website of Dhaka Stock Exchange. Microsoft Excel and STATA software have been used for data collection and statistical analysis.

The yearly average NPL of all sampled banks shows an upward trend as evidenced by Figure-1. The lowest NPL (3.00%) was in the year 2010 while the highest NPL (7.00%) was at the end of the sampled period, year 2022. Nevertheless, the graph shows some ups and downs over the observed period. Meanwhile, Table-1 states the name of the 22 sampled banks, their stock exchange listing year as well as their average NPL over the sampled period. From the table, it is evident that the oldest banks as per listing year are AB Bank PLC. (1983), National Bank Ltd. (1984) and Uttara Bank PLC. (1984). Despite being the oldest, the highest average NPL belongs to the same banks such as AB Bank PLC. (10.267%), National Bank PLC. (9.490%), and Uttara Bank PLC. (7.1333%). Whereas the youngest three banks i.e. BRAC Bank PLC., Premier Bank PLC. and Trust Bank Ltd. have less than 5% average NPL. Figure-2 demonstrates this graphically by plotting a bar chart of each sampled banks' average NPL during the period of 2010-2022.

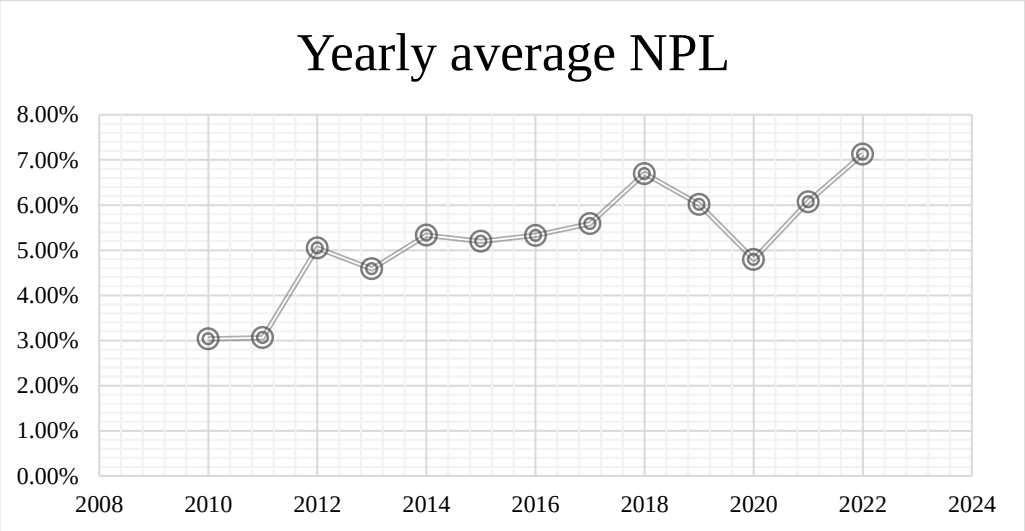
Table 1: Bank Name, Listing Year and Corresponding Average NPL

Sl.	Bank Code	Bank Name	Listing Year	Avg NPL
1	11101	AB Bank PLC.	1983	10.267%
2	11102	City Bank PLC.	1986	5.554%
3	11103	IFIC Bank PLC	1986	5.247%
4	11105	National Bank Ltd.	1984	9.490%
5	11108	United Commercial Bank (UCB) PLC.	1986	4.556%
6	11109	Uttara Bank PLC.	1984	7.133%
7	11112	Eastern Bank PLC.	1993	2.952%
8	11116	Prime Bank PLC.	2000	4.684%
9	11117	Southeast Bank PLC.	2000	4.626%
10	11118	Dhaka Bank PLC.	2000	4.604%
11	11119	National Credit and Commerce (NCC) Bank PLC.	2000	5.313%
12	11121	Dhaka Bank PLC.	2001	3.745%

Sl.	Bank Code	Bank Name	Listing Year	Avg NPL
13	11123	Mutual Trust Bank PLC.	2003	4.070%
14	11125	Standard Bank PLC.	2003	4.466%
15	11126	One Bank PLC.	2003	6.734%
16	11127	Bank Asia PLC.	2004	4.381%
17	11128	Mercantile Bank PLC.	2004	4.502%
18	11129	Export Import (Exim) Bank of Bangladesh PLC.	2004	3.976%
19	11134	Jamuna Bank PLC.	2006	5.052%
20	11138	BRAC Bank PLC.	2007	4.692%
21	11140	Premier Bank PLC.	2007	4.958%
22	11145	Trust Bank Ltd.	2007	3.878%

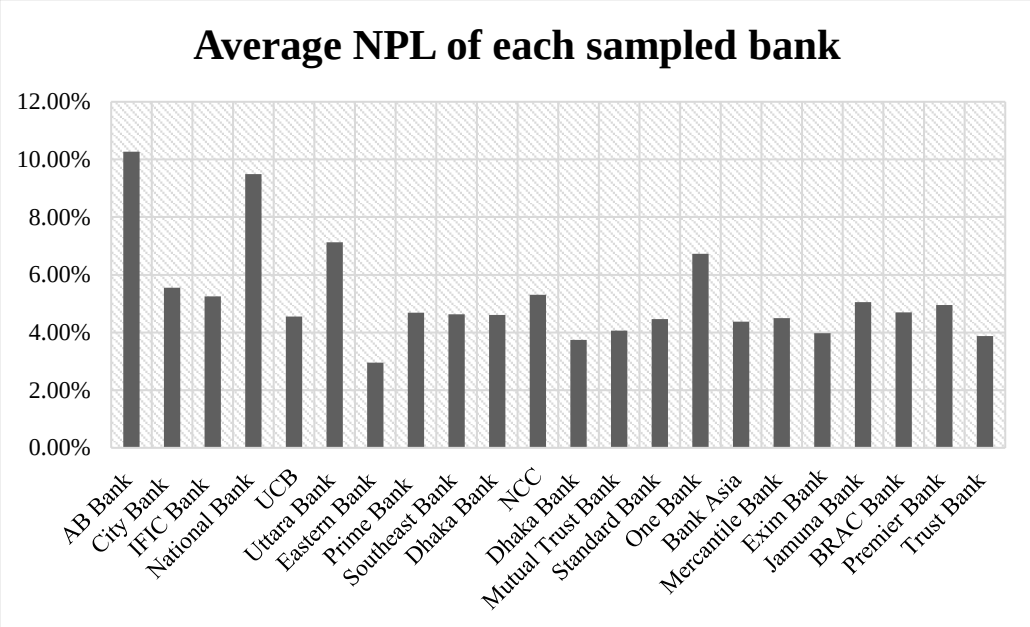
Source: Authors' calculation using data from Annual Reports of selected banks

Figure 2: Yearly Average NPL of All Sampled Banks



Source: Authors analyzed data from Annual Reports of selected banks

Figure 3: Overall Average NPL of Each Sampled Bank during 2010-2022



Source: Authors analyzed data from Annual Reports of selected banks

3.2 Model Specification

Table-2 shows the variables and acronyms used in this paper. The baseline model uses the Pooled OLS method. The regression equation is given below:

$$NPL_{i,t} = \alpha + \beta_1 ROA_{i,t} + \beta_2 INEFFICNCY_{i,t} + \beta_3 FIRMAGE_{i,t} + \beta_4 CAR_{i,t} + \beta_5 ASSTGRWTH_{i,t} + \beta_6 BOARD_{i,t} + \beta_7 FEMPCT_{i,t} + \beta_8 INDPCT_{i,t} + \sum_{t=1}^{n} \Omega_t YEAR_DUMMY_t + \varepsilon_{i,t} \quad (1)$$

The dependent variable, NPL is non performing loan as a percentage of total loan for bank *i* in the period *t*. We use multiple independent variables as per the existing literature. Table-2 mentions the variable names and definition. *YEAR_DUMMY* is incorporated in the regression to account for yearly variation and it represents twelve years' dummy variables for each corresponding year (from 2010 to 2022).

Table 2: Variable Definition and Acronyms

Abbreviation	Definition
Dependent variables	
NPL	Non performing loan divided by total loan
Independent variables	
ROA	Profit after tax divided by total assets
INEFFICNCY	Operating expense divided by operating income
FIRMAGE	Years since stock exchange listing
ASSTGRWTH	Growth of total assets compared to previous year
CAR	Capital adequacy ratio
BOARD	Natural log of the number of directors on board
FEMPCT	Number of female directors divided by total number of directors
INDPCT	Number of independent directors divided by total number of directors
YEAR_DUMMY	Dummy variables for each year which are equal to one if the observation belongs to corresponding year

4. Findings and Analysis

4.1 Descriptive Statistics

Table-3 shows the descriptive statistics of the dependent as well as independent variables over the period of 2010-2022. For 261 bank -year observations, we report average, standard deviation, minimum, 25th percentile, 50th percentile, 75th percentile and maximum values for each of the variables. The dependent variable, NPL has 5.54% mean. While the lowest value is 1.4% the highest value is 33.1%. Average profitability (ROA) of the sampled firms is 9% and average age is 18.67 years (since the listing year). Operating expense as a percentage of operating income (INEFFICNCY) is 89.6% on average. Nonetheless, the capital adequacy ratio is 12.8% with only 1.7% standard deviation. The corporate governance variables show that on average listed banks have 13 directors on board. Female participation is 12.3% while the 50th quartile value (median) is only 10%. Meanwhile, board independence is 17.9% on average.

Table 3: Descriptive Statistics

VARIABLE	N	MEAN	SD	MIN	P25	P50	P75	MAX
NPL	261	0.054	0.034	0.014	0.037	0.048	0.060	0.331
ROA	261	0.009	0.005	0.000	0.006	0.009	0.011	0.034
INEFFICNCY	261	0.896	6.336	0.247	0.427	0.482	0.550	102.817
FIRMAGE	261	18.663	9.178	4.000	12.000	16.000	27.000	39.000
ASSTGRWTH	261	0.136	0.078	-0.093	0.087	0.128	0.184	0.432
CAR	261	0.128	0.017	0.088	0.115	0.126	0.140	0.179
DIR NUM	261	13.448	4.016	6.000	11.000	13.000	16.000	26.000
BOARD	261	2.552	0.315	1.792	2.398	2.565	2.773	3.258
FEMPCT	261	0.123	0.107	0.000	0.048	0.100	0.182	0.429
INDPCT	261	0.179	0.103	0.000	0.118	0.167	0.214	0.700

4.2 Correlation Matrix

Table-4 shows correlation matrix to depict the strength as well as the direction of the relationship among variables used. Correlation coefficient ranges from 1 to -1 which shows whether the variables are positively or negatively correlated and if so to what extent (Steiger, 1980; Hassan *et al.*, 2023). None of the variables are highly positively correlated. From the table it is eident that the likelihood of multicollinearity being present in the sampled dataset is minimal. Yet, the significance of the most pairwise correlation values indicate a possible meaningful relationship among them which is further explored in regression analysis.

Table 4: Pairwise Correlation Matrix

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) NPL	1.000								
(2) ROA	-0.391***	1.000							
(3) INEFFICNCY	0.360***	-0.111*	1.000						
(4) FIRMAGE	0.404***	-0.236***	0.129**	1.000					
(5) ASSTGRWTH	-0.327***	0.349***	-0.183***	-0.242***	1.000				
(6) CAR	-0.110*	-0.240***	-0.122**	0.142**	-0.238***	1.000			
(7) BOARD	-0.204***	0.157***	-0.053	-0.073	-0.045	-0.007	1.000		
(8) FEMPCT	-0.050	-0.014	0.045	0.015	-0.034	0.205***	-0.171***	1.000	
(9) INDPCT	0.012	-0.219***	0.021	0.062	-0.058	0.241***	-0.534***	0.221***	1.000

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

4.3 Regression Analysis

In order to comprehend how NPL is being determined by the multiple independent factors we use three types of regression analysis suitable for Panel data. Table-5 (Panel-A) demonstrates results of three models such as Pooled OLS (Model-1), Fixed Effect (Model-2), and Random Effect (Model-3). The adjusted *R*-square values for these models are 0.471, 0.450 and 0.437 respectively. Using robust firm clustered standard errors, Model-1 shows that highly profitable firms have lower NPL as evidenced by significantly negative coefficient (-1.170). This is similar to the findings in literature review (Godlewski, 2005; Khan *et al.*, 2020). As expected, the more operating inefficiencies banks have, the higher are their NPL as inefficient banks are unlikely to provide quality loans nor do proper credit monitoring (Berger & DeYoung, 1997; Ekanayake & Azeez, 2015; Khan *et al.*, 2020). This is also congruent with the "Bad management hypothesis". Moreover, older firm tends to have higher NPLs which is consistent with findings of Table 1 but inconsistent with findings of study done by Partovi and Matousek (2019) in Turkey. This sharp contrast may be due to the older banks often face the influence of the borrowers' political, economic and other lobbies in Bangladesh (Rehman *et al.*, 2024). Thus, we reject H3 hypothesis. Furthermore, Capital Adequacy Ratio (CAR) is significantly negatively linked to NPLs indicating the possibility that banks with comparatively little capital may participate in risky lending behavior which can ultimately increase the amount of NPLs (Gambacorta & Mistrulli, 2004; Khan *et al.*, 2020). This negative association is also congruent with the findings of Ozili (2017) who studied African banks. This finding is consistent with the "Moral hazard hypothesis".

Table 5: Panel A - Pooled OLS, Fixed Effect and Random Effect Model

	(1)	(2)	(3)
VARIABLES	NPL	NPL	NPL
	Pooled OLS	Fixed Effect	Random Effect
ROA	-1.170***	-1.371***	-1.271***
	(0.373)	(0.279)	(0.282)
INEFFICNCY	0.001***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)
FIRMAGE	0.001**	0.005	0.001**
	(0.000)	(0.006)	(0.000)

VARIABLES	(1) NPL	(2) NPL	(3) NPL
	Pooled OLS	Fixed Effect	Random Effect
CAR	-0.546**	-0.645**	-0.598**
	(0.241)	(0.252)	(0.245)
ASSTGRWTH	-0.104***	-0.053**	-0.078***
	(0.032)	(0.023)	(0.026)
BOARD	-0.022	-0.054*	-0.031*
	(0.015)	(0.030)	(0.018)
FEMPCT	-0.010	-0.021	-0.012
	(0.022)	(0.051)	(0.030)
INDPCT	-0.051	-0.070*	-0.066**
	(0.031)	(0.036)	(0.034)
CONSTANT	0.191**	0.207	0.237***
	(0.068)	(0.127)	(0.091)
Year Dummy	Yes	Yes	Yes
Adjusted *R*-Sq	0.471	0.450	0.4369
F-STAT/ Wald Chi Sq	4467.47	191993.19	501688.57
Observations	261	261	261
Number of firms		22	22

Note: These models are assessed by applying robust firm-clustered standard errors as stated inside parentheses. ***, ** and * specify significance at the 1%, 5% and 10% level, correspondingly.

Table 5: Panel B - VIF

VARIABLE	VIF
CAR	1.88
ASSTGRWTH	1.72
ROA	1.64
INDPCT	1.63
BOARD	1.53
FIRMAGE	1.21
INEFFICNCY	1.16
FEMPCT	1.12
Mean VIF	1.49

In addition, we find growth of total assets (ASSTGRWTH) reduces NPL. This can be due to the fact that high growth banks need external funding to grow and are subject to more prudent external monitoring (Cyree *et al.*, 2000) which can ensure higher quality of loans and lower NPLs. However, the corporate

governance variables like board size, female participation and board independence do not have significant effect in the Pooled OLS regression. This result is not surprising given that in Bangladesh, board diversity is often argued to be ineffective as directors are often allies of the large loan defaulters (Rashid, 2018; Rashid *et al.*, 2020; Rehman *et al.*, 2024). Female directors are often the wives or daughters of the owners which is merely used as token female representation and does not bring any qualitative change on the board functionality. Moreover, lack of variation in the percentage of women on boards can also be a primal reason for the insignificant role of women directors (Sattar *et al.*, 2021). Thus, based on our empirical results, we accept hypotheses 1, 2, as well as 4 but fail to accept hypothesis 3, 5a, and 5b. We have found that Variance Inflation Factor (VIF) is lower than 3 which reconfirms that multicollinearity is not present in the dataset. This means the variance of calculated regression coefficients are not overstated as there are low correlations among the ROA, asset growth, CAR, and other independent variables. The VIF values are reported in Table 5 Panel B which shows the Mean VIF of the explanatory variables is 1.49.

Furthermore, empirical studies frequently applies the Fixed-Effects (FE) regression to cater for time-invariant omitted variable bias which can cause endogeneity (Hill *et al.*, 2020). One of the primary purposes of using fixed effects model is to control for unobserved factors that vary across entities but remain constant over time (Borenstein *et al.*, 2010). By focusing only on within-bank variations, we eliminate the bias caused by these unobserved factors. Thus, fixed effect model reduces possibility of endogeneity as it caters firm specific characteristics (Borenstein *et al.*, 2010). We, therefore, estimate our baseline regression after including bank Fixed Effect (Model-2) and our results remain qualitatively similar. Given the panel structure of our sample, we also applied Random Effects (RE) models following Khan *et al.* (2020). A random effects model is a popular statistical approach used in panel data analysis when the data consists of multiple observations for each entity (e.g., individuals, firms, countries, or time periods). The random effects model is typically applied when the assumption is that the unobserved factors affecting the dependent variable are not constant across entities but instead vary randomly (Borenstein *et al.*, 2010). The results are presented in Model-3 of Table-5 and remain mostly consistent

with the baseline model. However, in both FE and RE models, greater percentage of independent directors are reducing NPLs unlike the pooled OLS.

4.4 Subsample Analysis

In order to gain deeper insights into data, Table-6 divides the sample into subsamples based on Risk (Model 1-2) and Growth (Model 3-4) in order to examine the effect of the independent variables in different groups of banks. The sample is divided into two groups where High Risk group comprises sample observations with more than median risk while the rest is included in Low Risk group. Results show that for low risk group the effect of profitability is higher. However, higher capital adequacy only reduces NPL in high risk banks. On a similar note, the sample is divided into two groups where High Growth group comprises observations which have more than median asset growth and rest is included in Low Growth group. Here, findings indicate that the effects of ROA, inefficiency and CAR are higher for banks falling to the Low Growth category. This depicts the effect of the drivers depending on which category the bank belongs to.

Table 6: Subsample analysis

	(1)	(2)	(3)	(4)
VARIABLES	NPL	NPL	NPL	NPL
	High Risk	Low Risk	High Growth	Low Growth
ROA	-1.077*	-2.260**	-0.735***	-1.658**
	(0.583)	(0.908)	(0.209)	(0.656)
INEFFICNCY	0.001**	-0.003	-0.005	0.001***
	(0.000)	(0.003)	(0.024)	(0.000)
FIRMAGE	0.001**	0.001	0.001*	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
CAR	-0.750**	-0.385	-0.305*	-0.674**
	(0.339)	(0.247)	(0.166)	(0.311)
ASSTGRWTH	-0.143*	-0.078***	-0.041	-0.165***
	(0.070)	(0.022)	(0.032)	(0.056)
BOARD	-0.027	-0.020	-0.005	-0.029*
	(0.021)	(0.015)	(0.010)	(0.016)
FEMPCT	-0.007	-0.045	0.017	-0.012
	(0.027)	(0.036)	(0.016)	(0.029)

VARIABLES	(1) NPL	(2) NPL	(3) NPL	(4) NPL
	High Risk	Low Risk	High Growth	Low Growth
INDPCT	-0.060	-0.003	-0.032	-0.046
	(0.040)	(0.032)	(0.024)	(0.038)
CONSTANT	0.246**	0.188***	0.105**	0.231***
	(0.102)	(0.062)	(0.046)	(0.068)
Year Dummy	Yes	Yes	Yes	Yes
Adjusted *R*-Sq	3299.89	60.59	204.28	3444.68
F-Stat	120	119	130	131
Observations	0.528	0.422	0.360	0.561

Note: These models are assessed by applying robust firm-clustered standard errors as stated inside parentheses. ***, ** and * show significance at the 1%, 5% and 10% level, correspondingly.

4.5 Role of Corporate Governance during Pandemic

COVID-19 has triggered an unprecedented financial crisis in the global economy and heighted the weakness in the banking landscape which affected developed as well as developing countries alike (Cevik & Miryugin, 2021; Sattar & Jalal, 2024). Therefore, we further want to investigate whether the pandemic has any moderating or indirect effect influencing the aforementioned relationship. Table-7 looks at the link between NPL and key independent variables while tailoring for moderation effect of corporate governance factors such as board size, female directors and independent directors. Here, the variable PANDEMIC is a dummy variable which is equal to one if year is 2020 and zero otherwise. Results show that the interaction term between pandemic and board size and female directors is negative and significant. However, the interaction term with independent directors and pandemic is not significant. This means that during pandemic large board size and increased number of female directors reduced NPL in banks. Kara *et al.* (2022) find that board gender diversity has a noteworthy impact in banks' primary responses to the pandemic by supporting their customers, governments and communities. Moreover, women on board are traditionally found to be risk averse and their monitoring role might be beneficial in terms of reducing NPL during pandemic (Chen *et al.*, 2019; Sattar *et al.*, 2022; Khan *et al.*, 2024).

Table 7: Role of Corporate Governance during Pandemic

VARIABLES	(1) NPL	(2) NPL	(3) NPL
ROA	-1.306***	-1.315***	-1.299***
	(0.378)	(0.369)	(0.378)
INEFFICNCY	0.001***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)
FIRMAGE	0.001**	0.001**	0.001**
	(0.000)	(0.000)	(0.000)
CAR	-0.453*	-0.446*	-0.461*
	(0.242)	(0.241)	(0.244)
BOARD	-0.020	-0.021	-0.022
	(0.014)	(0.014)	(0.014)
FEMPCT	-0.008	-0.002	-0.009
	(0.023)	(0.023)	(0.024)
INDPCT	-0.059*	-0.057*	-0.061*
	(0.032)	(0.032)	(0.034)
PANDEMIC	0.019	-0.005	-0.020**
	(0.020)	(0.006)	(0.007)
PANDEMIC*BOARD	-0.015*		
	(0.008)		
PANDEMIC*FEMPCT		-0.085***	
		(0.023)	
PANDEMIC*INDPCT			0.011
			(0.028)
CONSTANT	0.181**	0.179**	0.185**
	(0.073)	(0.073)	(0.075)
Year Dummy	Yes	Yes	Yes
Adjusted *R*-Sq	0.445	0.449	0.444
F-Stat	8760.8	31987.48	11063.14
Observations	283	283	283

Note: These models are assessed by applying robust firm-clustered standard errors as stated inside parentheses. ***, ** and * show significance at the 1%, 5% and 10% level, correspondingly.

4.6. Endogeneity Corrections

Despite the interesting results from baseline estimates, the possibility of NPL being correlated with past values can not be ruled out. In banking literature, endogeneity often creates problems by biasing the estimates (Ghosh, 2015). Understanding how a change in profitability impacts the NPL of banks requires careful analysis to separate the direct effects from potential reverse causality or other confounding factors. Reverse causality or unobserved heterogeneity can cause spurious results in pooled OLS models (Khatib, 2024). For example, bank capital can have negative effect on NPL as banks with inadequate capital might be tempted to provide high risk dubious loans. Nonetheless, it can also be the case that banks facing capital shortfalls will be forced not to provide risky loans as high level of NPLs can erode a bank's capital over time by reducing its profitability and raising loan loss provisioning. Correcting for endogeneity will allow to confidently infer causal relationships of the base estimates, which is essential for building robust economic models. Thus, we applied two step System GMM model which uses lagged values of dependent variable as exogenous instruments and report the results in Table 8. Our findings indicate that lagged value of NPL has a significant positive coefficient which confirms that this is a dynamic panel dataset and firms having higher value of NPL last year have more NPL in the current year. Arellano-Bond (AR2) test for autocorrelation is not significant, showing that there is no serial order autocorrelation in the dataset. Hansen test for overidentifying restrictions is also insignificant, which confirms validity of the instruments. Similar to our baseline findings, ROA, inefficiency, firm age, and Capital adequacy ratio have significant coefficients. Thus, after addressing potential endogeneity, the aforementioned key drivers of NPL are corroborated.

Table 8: Baseline Estimation using System GMM

VARIABLES	(1) NPL
L.NPL	0.243**
	(0.091)
ROA	-1.285***
	(0.278)
INEFFICNCY	0.001***

	(1)
VARIABLES	NPL
	(0.000)
FIRMAGE	0.001**
	(0.000)
CAR	-0.447*
	(0.228)
BOARD	-0.021
	(0.015)
FEMPCT	-0.009
	(0.021)
INDPCT	-0.052*
	(0.029)
CONSTANT	0.151*
	(0.079)
YEAR DUMMY	YES
ARELLANO-BOND TEST FOR AR (1)	-1.86*
ARELLANO-BOND TEST FOR AR (2)	1.61
HANSEN TEST	0.02
F-STATISTIC	2.39E+06
OBSERVATIONS	261
NUMBER OF BANKS	22

Note: These models are assessed using robust firm-clustered standard errors as stated inside parentheses. ***, ** and * indicate significance at the 1%, 5% and 10% level, respectively.

5. Conclusion, Policy Implications and Recommendations

A stable banking sector ensures smooth flow of funds, expedites crisis recovery, fuels economic growth and maintains financial system resilience in a country. The banking sector's role is more significant for emerging economy like Bangladesh, as it provides both short- and long-term capital in the absence of a vibrant capital market. In addition, an active banking system makes substantial use of the resources available through proper allocation. Subsequently, high levels of NPLs can possibly lead to a lack of confidence in the banking industry and undermine the stability of the financial system as capital will be locked in unproductive assets. In emerging economies, where financial institutions may already face structural weaknesses, NPLs can significantly strain the system. Thus, it is imperative that Bangladeshi banks identify the factors of the growing percentage of non-performing loans and take corrective measures to address

them. In this paper, we present empirical evidence from bank-specific factors that cause Non-performing Loans (NPLs) to rise in Bangladesh. Our findings will assist banks and policymakers in responding to the considerable risk factors associated with NPLs aggregation.

In this study we analyzed panel data of 22 listed commercial banks during 2010-2022 to examine the bank-specific factors that cause NPLs to rise in Bangladesh. Our findings confirm the hypothesis that profitability, capital adequacy and asset growth of banks are negatively associated with NPLs. Additionally, we report evidence that higher inefficiency increases NPLs in banks consistent with "Bad management hypothesis". In other words, by increasing bank efficiencies and controlling expenses, banks can effectively reduce NPLs. However, corporate governance factors comprising board size and female representation of board have no impact on NPLs. However, the percentage of independent directors reduces NPL as they are likely to be effective in monitoring loans. According to subsample study, the impact of determining factors differs for distinct risk and growth categories (High vs. Low). Furthermore, the size of board and female participation on board play a significant part in reducing NPLs during pandemic.

Our study makes several contributions to the existing banking literature and provides important policy implications. Instead of using macro-economic determinants which are largely standardized and exogenous to the banking industry, we use bank specific drivers of NPLs. We include diverse determinants including corporate governance factors. The wide range of time period (13 years) of the sample also increases the reliability of the study. Our findings highlight the importance of maintaining high profitability, ensuring there is additional capital available to absorb any unanticipated losses, investing in assets with greater projected returns and focusing on board structure. Besides, banks need robust processes for screening and monitoring borrowers along with enforcing credit agreements in order to reduce NPLs. In addition, our findings of inverse relationship between independent directors and NPL signifies that independent directors may be able to reduces politically motivated or insider lending, a major driver of NPLs in Bangladesh. Thus, policymakers must strictly enforce

Corporate Governance Code so that banks increase the number of independent directors who can push for stricter credit risk assessments and prevent loans being approved on the basis of favoritism or pressure. Finally, proactive measures can be implemented to recover from high NPL levels during exogenous shock like pandemic; for instance, larger board and higher representation of female directors on board can lower NPL ratios during exogenous crisis.

The availability of data is one of the limitations in this study since unobserved heterogeneity resulting from political connections, family ownership, corruption, etc. could be present in the dataset which can bias the outcome of the research. For example, political influence can significantly shape borrower selection, loan recovery processes, and regulatory oversight. Directors with strong political ties may secure favorable treatment in loan approval or restructuring, which directly affects the level of NPLs. However, due to the difficulty of systematically observing or measuring such political connections, these variables could not be included in this research. Moreover, family-owned banks often face ownership concentration which can sturdily impact risk-taking behavior and credit allocation of the banks. Such limitations suggest that the findings of this research should be interpreted with caution. Future researchers may run robust endogeneity tests such as Heckman Selection Model, Two Stage Least Square, Three Stage Least Square which could not be applied here in absence of exogenous instruments. Furthermore, the examined models could be applied to unlisted private commercial banks, state-owned banks, multinational banks, and Islami Shariah based commercial banks in order to provide an expanded overview of the variables influencing the NPL rate in the Bangladeshi banking industry.

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